REMARKS

Claims 1 - 21 are pending in this application, of which claims 17 - 21 have been withdrawn from consideration. By this Amendment, claim 17 has been amended to rejoin the method claims. Applicants respectfully submit that no new matter has been added. It is believed that this Amendment is fully responsive to the Office Action dated November 18, 2002.

As to the Merits:

Claims 1 - 16 stand rejected under 35 U.S.C. §103(a) as being unpatentable over **Tsang** (U.S. Patent No.: 5,208,824).

This rejection is respectfully traversed.

Claim 1 defines a distributed feedback semiconductor laser comprising a lower quantum well structure extending along a resonator direction, an intermediate layer disposed on the lower quantum well structure, and an upper quantum well structure periodically disposed on the intermediate layer, wherein envelope of the upper quantum well structure is formed by etched profile extending to the intermediate layer. The previously added feature clarifies that the upper quantum well structure is formed by etching using the intermediate layer as an etch stopper layer. Claim 2 further defines a diffraction grating-burying layer covering the upper quantum well structure. Claim 3 further defines that the intermediate layer has a surface step of a same repetition period and a same phase as the

upper quantum well structure. This feature is another aspect of the previously added feature of claim 1 that the upper quantum well structure is formed by etching using the intermediate layer as an etch stopper layer. These features are not disclosed nor suggested by Tsang.

Tsang discloses a distributed feedback (DFB) laser comprising a lower periodic quantum well structure, an intermediate layer, and an upper continuous quantum well structure. The Examiner takes the position that it is an obvious aesthetic design choice to switch these.

First, Tsang does not teach nor suggest to switch the upper and the lower quantum well structures. The structure of the semiconductor device is closely connected with the fabrication processes. The lower periodic quantum well structure of Tsang, as shown in Fig. 1, is formed of quantum well layers 121, 122, barrier layers 131, 132, and is manufactured by etching the stacked layers (e.g. see the Abstract, column 5, lines 6 - 13). For completely etching the stacked layers, the etched profile should extend a certain depth into the substrate 11, as is clearly shown in Fig. 1. Thus, the substrate with corrugated surface is also a necessary constituent element of the lower periodic quantum well structure of Tsang.

In Tsang, it is necessary to form an upper quantum well structure above the lower quantum well structure. Formation of the upper quantum well structure requires a planarized surface. Thus, the etched corrugated surface is embedded by the spacer layer 15 to form a planarized surface. The lower periodic quantum well structure is formed of the substrate 11, the stacked layers 121, 122, 131,

132, and the spacer layer 15. Then, a waveguide layer 16 is grown thereon. The upper quantum well structure of stacked layers 17 and 18 is formed on the waveguide layer 16 (see column 5, lines 14 - 24).

When the Examiner states to switch the upper quantum well structure and the lower periodic quantum well structure, what is meant by the lower periodic quantum well structure? The lower quantum well structure is formed of the substrate 11, the stacked layers 121, 122, 131, 132, and the spacer layer 15. Tsang does not have an enabling disclosure for such rearrangement. If these elements 11, 121, 122, 131, 132, and 15 were rearranged above the upper quantum well structure with the waveguide layer 16 intervening the two QW structures, the resulting structure is far different from the applicant's claimed structure.

Although the Examiner states that the method of forming the device is not given patentable weight, the method of forming a semiconductor device is reflected to the structure. Therefore, the method of forming the device defines structural feature of the device. When the upper quantum well structure of the applicant's invention is etched, it is almost impossible to stop the etching just at the bottom surface of the upper quantum well structure. The intermediate layer serves an etch stopper layer, and allows the etched profile to extend into the intermediate layer. In Tsang, the substrate 11 serves as the etch stopper. Tsang does not teach to utilize the waveguide layer 16 as an etch stopper.

In Tsang, the spacer layer 15 and the waveguide layer 16 are grown on the lower QW structure to embed the corrugated surface. For embedding the corrugated surface and forming a planarized surface, it is necessary to grow the spacer layer 15 above a certain thickness. Further the waveguide layer 16 is grown thereon. This means that the distance between the lower QW structure and the upper QW structure cannot be reduced below some thickness. The intermediate layer of the applicant's invention has no such embedding requirement. It is only necessary for the intermediate layer to serve as an etch stopper. Provided that the intermediate layer severs as an etch stopper, the thickness of the intermediated layer can be selected more freely than in Tsang. This will lead to higher freedom in the optical design to the laser device.

The applicant's claimed structure can be manufactured by first growing the overall quantum well structure including the lower quantum well structure and the upper quantum well structure, and then etching only the upper quantum well structure, possibly followed by embedding the etched upper quantum well structure (as in claim 2). In contrast to this, Tsang's device should be formed first by growing the lower quantum well structure, then etching the lower quantum well structure, embedding the etched quantum well structure and forming a flat surface, and growing the upper quantum well structure. It is apparent that Tsang needs separated crystal growth steps.

Thus, as described above, it is not obvious to switch the upper and the lower quantum well structures in Tsang, and the required processes for the Tsang structure and the applicant's structure are quite different.

In addition, claims 2 and 3 further define additional features which are not taught by Tsang. Further, claims 2 - 21 depend from claim 1, and should also be distinguished over Tsang for at least the reasons set for above.

In view of the aforementioned amendments and accompanying remarks, claims 1 - 21, as amended, are in condition for allowance, which action, at an early date, is requested.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicants undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "**Version with markings to show changes made**."

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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Enclosures: Version with markings to show changes made

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VERSION WITH MARKINGS TO SHOW CHANGES MADE 09/805,182

IN THE CLAIMS:

Claim 17 has been AMENDED to read as follows:

17. (Amended) A method of manufacturing [a] the distributed feedback semiconductor laser according to claim 1, said method comprising the steps of:

(a) growing on a semiconductor substrate a lamination of alternately stacked lower barrier layer and lower well layer having a band gap narrower than the lower barrier layer, to form a lower quantum well structure;

(b) growing an intermediate layer on an uppermost lower well layer, the intermediate layer having a band gap broader than the lower well layer and a thickness thicker than the lower barrier layer;

(c) growing on the intermediate layer a lamination of alternately stacked upper well layer and upper barrier layer having a band gap broader than the upper well layer and a thickness thinner than the intermediate layer, to form an upper quantum well structure;

(d) forming a mask on the upper quantum well structure, the mask having periodical pattern;

(e) by using the mask as an etching mask, etching the upper quantum well structure in a periodical shape by using the intermediate layer as an etching margin layer; and

(f) removing the mask.